Structuring Collaboration Scripts

Optimizing online group work on classroom dilemmas in teacher education

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Introduction

- Use serious games to enable collaboration on professional problems
- Explain the role of scripts in collaboration games
- Define and optimize the structure of collaboration scripts
- Introduce the mastership game
- Pose hypotheses

Introduction: workplace learning

- Professionals are lifelong learners that continuously face problem situations in their workplace that change dynamically and rapidly
- Organisations' tacit knowledge can only be expressed and accessed in direct collaboration on professional tasks (e.g., Nonaka & Takeuchi, 1995)
- Games may take workplace contexts as starting point to stimulate learners acquire new knowledge by sharing and co-creating (e.g., Bell *et al.*, 2008)

Introduction: collaboration scripts

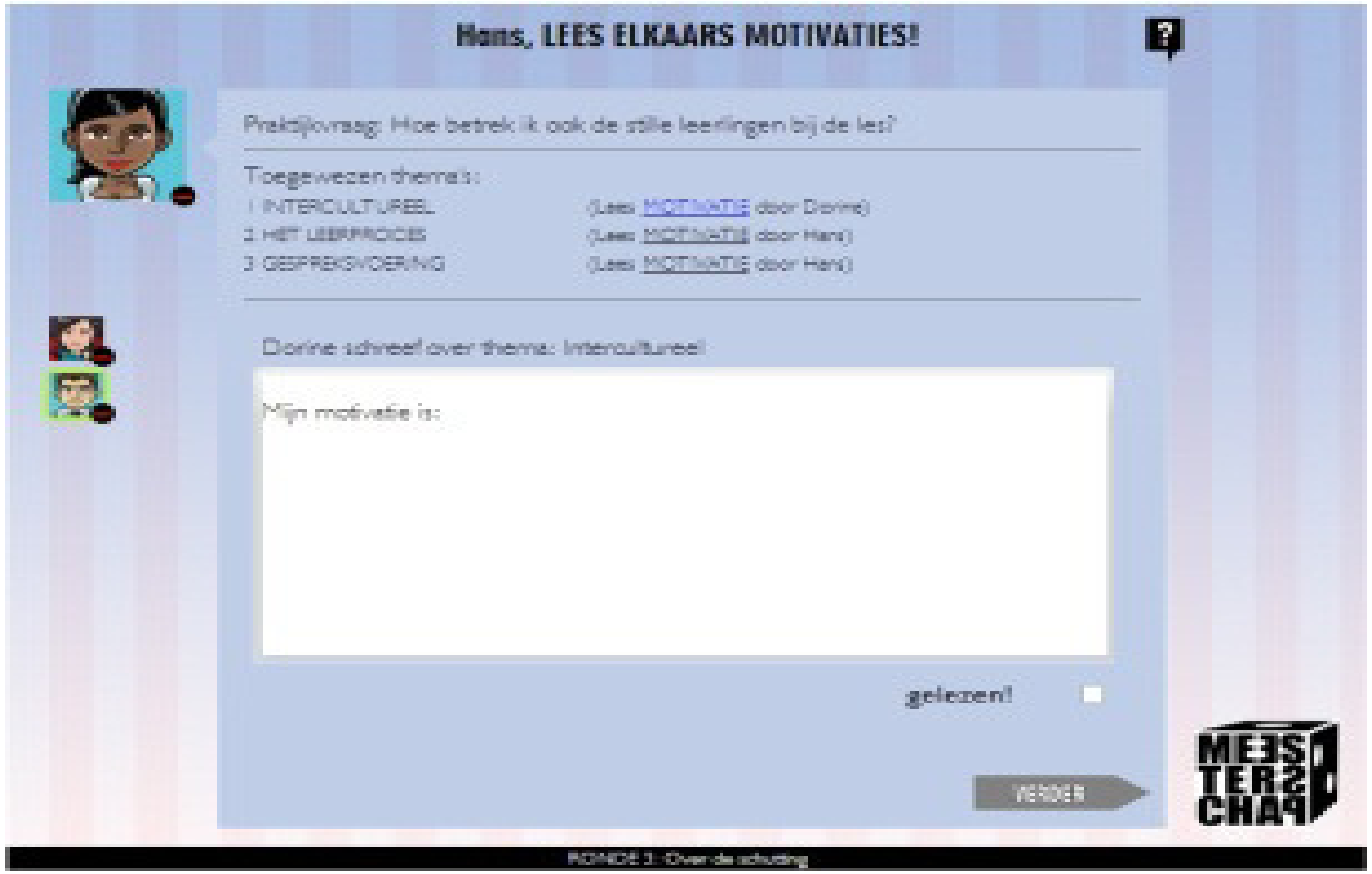
- Collaboration scripts (Kobbe *et al*., 2007) are an instructional method that structures the collaboration by guiding the interacting partners online through a sequence of interaction phases with designated activities and roles
- Collaboration scripts have hardly been tested in more open and flexible learning environments like serious games (Dillenbourg & Hong, 2008)
- No research has focused on optimizing essential structure elements, nor has measured the learning effects of collaboration scripts in serious game play

Introduction: structure

- An optimal level of structure appears to be a key success factor for effective learner support
- Risks of over-scripting: ‘mathematanic’ versus ‘mathemagenic’ (Rothkopf, 1996)
- *Segmentation* and *inter-dependency* within the task constitute the main structure elements (e.g., Dillenbourg, 2002)

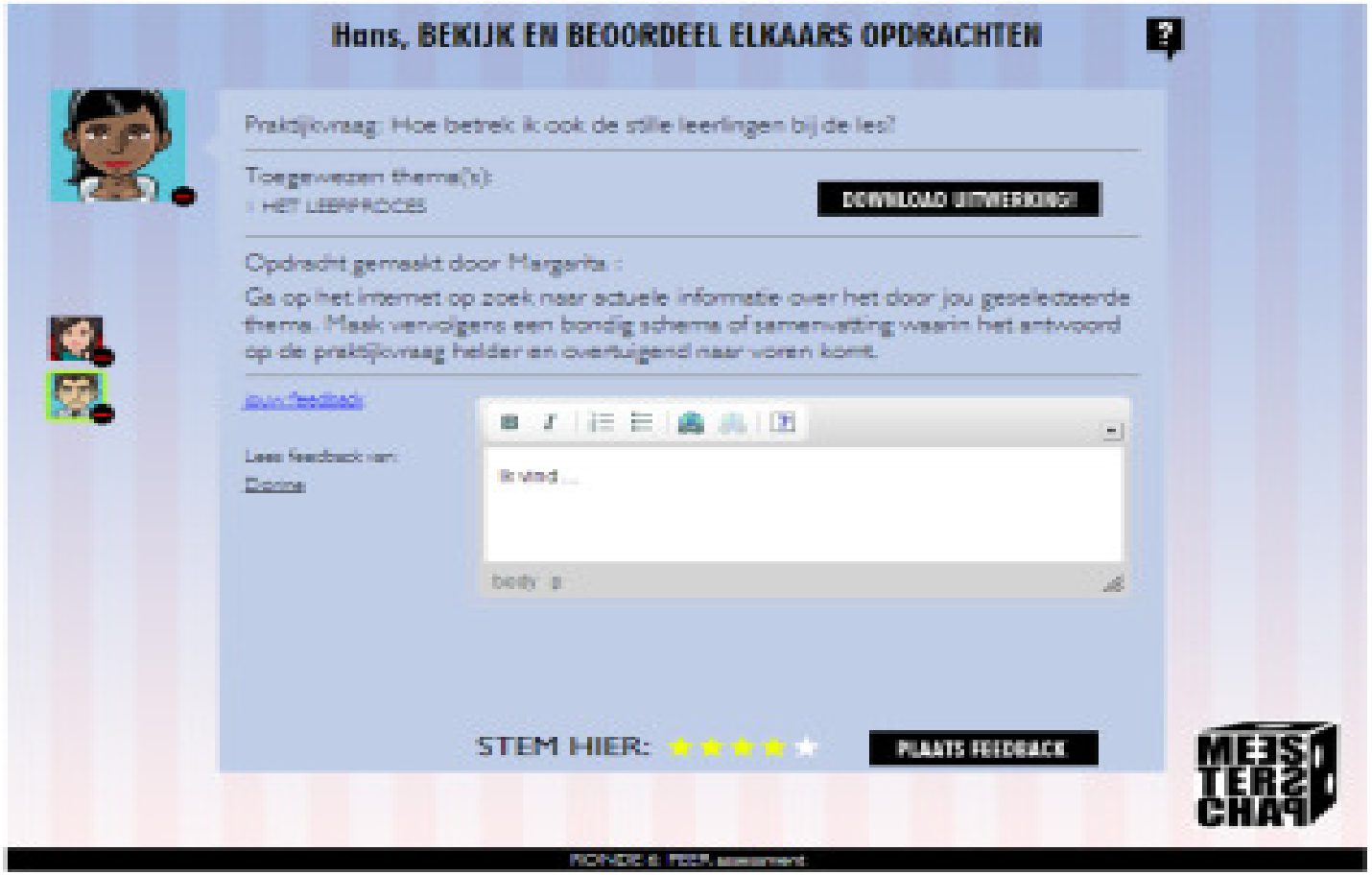
Selecting a classroom dilemma (phase 1)

Discussing assigned themes (phase 3)



Negotiating declined themes (phase 4)

Peer assessment (phase 6)



Introduction: hypotheses

- Will less structure lead to more ‘natural’ and effective collaborative learning? (We hypothesize that the individual reports of those that played the low-structured game will be objectively graded higher by their teachers and peers)
- Will less structure in the collaboration be appreciated more by students? (We hypothesize that students will subjectively appreciate the low-structured game higher on a number of aspects)

Method

- 29 teachers-in-training
- Experiment with 3 conditions: high- and low structured game, (non-playing) control group (→ definition, elements of structure)
- Learning effects measures to proof first hypothesis (→ correction model)
- Student satisfaction measures to proof second hypothesis (→ questionnaire)

Method: structure elements

Scene	a1 (has to finish scene)	a2 (cards to draw)	b1 (wait for others)	b2 (feedback required)	b3 (others draw cards)
1_1	true	3/2/1	true/false	false	false
1_2	true	1	true/false	false	false
2_1	false	-	true/false	false	false
2_2	true/false	-	true/false	false	false
2_3	true/false	-	true/false	true/false	false
3_1	true	3/2/1	true/false	false	true/false
3_2	true/false	-	true/false	false	false
4_1	true/false	-	true/false	false	false
4_2	true	-	true	true	false
4_3	true	-	true	true	false
5_1	true	-	true/false	true/false	false
5_2	-	-	-	-	-
6_1	-	-	-	-	-
6_2	-	-	-	-	-

Method: correction model

Subscales	Insufficient (0 points)	Sufficient (1 point)	Good (2 points)	Score
A. Ownership	Refers to others: "They will solve the problem"	"I will take action"	The answer shows real commitment.	0-2
B. Reflection	No reflection	Some reflection, partly rich	Rich reflection	0-2
C. Focus	The problem has not been framed / focused	The problem has partly been focused	The problem is rich and has been correctly focused	0-2
D. Nuance / complexity	The answer does not contain nuance	The answer is correctly linked to one design pattern	The answer is correctly linked to (a network of) more design patterns	0-2
E. Richness / correctness	The elaboration is not correct	The elaboration is partly rich and correct	The elaboration is rich and correct	0-2
Total score				0-10

Method: satisfaction questionnaire

Item	Aspect	+/-	Statement
1	U	+	The way to play the game is clear, playing rules are clear.
2	Q	+	The elaborations (of practical assignments) by co-players were of sufficient quality
3	Q	+	The composition of the group was good (regarding interest and level of expertise).
4	U	+	The user-interface of the game is clear and user-friendly.
5	S	+	Group play was possible without teacher intervention, the collaboration process has been determined well in advance.
6	T	-	The time allowed to play was too low.
7	S	-	The amount of game structure is too low.
8	U	+	The time allowed for each phase was too low.
9	S	-	The amount of structure in each phase is too high.
10	T	-	The time allowed for each phase was too high.
11	U	-	The way to collaborate during each phase was too complex.
12	I	+	Mutual interaction and collaboration proceeded well and were useful.
13	Q	+	Feedback (assigning cards, peer assessment, etc.) from co-players was useful (in further elaborating my assignment).
14	Q	+	The elaborations of the exploratory assignments by co-players were of sufficient quality.

Results: teacher grades

	High structure (n = 9)		Low structure (n = 10)		Control (n = 10)		All (N = 29)	
Assessment	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Teacher grade	**6.44**	**1.59**	**7.35**	**1.03**	**6.05**	**0.93**	**6.62**	**1.29**
Peer rating	**7.93**	**.66**	**7.52**	**1.04**	**7.68**	**0.89**	**7.70**	**0.87**

Results: teacher grades

- Most individual reports (76%) were graded as sufficient ($M = 6.62$, $SD = 1.29$)
- Condition effect is 'marginally' significant ($F(2, 26) = 3.072$, $MSE = 4.428$, $p = 0.063$, $\eta_p^2 = 0.18$)
- Low-structure outperforms control significantly ($t(18) = 2.97$, $p < 0.01$), an effect not significant for high-structure ($t(17) = 0.67$, $p = 0.51$)
- Low-structure outperforms high-structure significantly ($t(17) = 4{,}86$, $p = 0.042$)
- Weighted Kappa was acceptable ($K_w = .47$, $\delta = .08$), and without sub-scale B even good ($K_w = .68$, $\delta = .09$)

Results: student satisfaction

	High structure (n = 9)		Low structure (n = 10)		All (N = 19)		
Item	*M*	*SD*	*M*	*SD*	*M*	*SD*	**pΔ**
1	3.00	1.41	2.70	1.25	2.85	1.30	**.64**
2	4.00	0.76	4.00	0.82	4.00	0.76	**1.00**
3	3.50	1.31	4.20	0.92	3.89	1.13	**.20**
4	2.88	1.25	3.50	1.08	3.22	1.17	**.27**
5	2.38	1.40	2.67	1.50	2.53	1.42	**.67**
6	2.25	0.89	1.40	0.52	1.78	0.81	**.02**
7	3.13	1.25	3.40	1.07	3.28	1.13	**.62**
8	3.25	1.49	4.20	1.03	3.78	1.31	**.13**
9	2.75	0.87	2.30	0.95	2.50	0.92	**.32**
10	2.13	0.83	2.20	1.40	2.17	1.15	**.89**
11	4.00	0.53	2.90	1.37	3.39	1.19	**.04**
12	3.38	1.51	2.80	1.23	3.06	1.35	**.38**
13	2.88	1.36	3.00	0.90	2.91	1.14	**.88**
14	3.13	0.99	3.33	0.82	3.21	0.89	**.68**
15	2.88	0.99	2.33	1.16	2.73	1.01	**.46**
16	2.50	1.31	2.56	1.24	2.53	1.23	**.93**
17	4.25	1.04	3.56	1.24	3.88	1.16	**.23**
18	3.00	1.07	3.67	1.55	3.18	1.08	**.39**
19	**3.00**	**1.19**	**3.22**	**1.56**	**3.12**	**1.36**	**.75**

Results: student satisfaction

Item	High structure (n = 9) M	High structure (n = 9) SD	Low structure (n = 10) M	Low structure (n = 10) SD	All (N = 19) M	All (N = 19) SD	pΔ
1	3.00	1.41	2.70	1.25	2.85	1.30	.64
2	4.00	0.76	4.00	0.82	4.00	0.76	1.00
3	3.50	1.31	4.20	0.92	3.89	1.13	.20
4	2.88	1.25	3.50	1.08	3.22	1.17	.27
5	2.38	1.40	2.67	1.50	2.53	1.42	.67
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18	3.00	1.07	3.67	1.55	3.18	1.08	.39
19	3.00	1.19	3.22	1.56	3.12	1.36	.75

"Time allowed to play was too low"

"The way to collaborate during each phase was too complex"

Results: student satisfaction

- No significant differences for peer ratings
- No significant differences on student satisfaction, with just two exceptions

Conclusions

- Collaboration can be enabled by serious games
- Over-scripting has disruptive effects (e.g., order and turns)
- Collaboration scripting holds promise for future research but requires a. theory of guidance, b. dedicated authoring, and c. studies into various collaboration patterns

Questions / Discussion